

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A serial printing method for recording an image on a recording material one line by one line, said line including one or more rows and said line being recorded by moving a recording head in a width direction of said recording material, said serial printing method comprising the steps of:

recording said row with said recording head on a sheet;

detecting whether or not a print defect occurs on said recorded row on said sheet based on whether a difference between recorded data and reference data exceeds a predetermined threshold; and

performing correction recording, on said sheet, relative to said row on which said print defect occurs based on whether the difference exceeds the threshold.

2. (original): A serial printing method according to claim 1, wherein said line includes a plurality of said rows respectively recorded with recording elements of said recording head.

3. (original): A serial printing method according to claim 2, wherein said print defect of said row is detected by measuring a density of each pixel constituting said row, and said correction recording is performed relative to said pixel on which a lack of density occurs.

4. (original): A serial printing method according to claim 1, wherein said recording material is a thermosensitive recording paper including a thermosensitive coloring layer, and said recording head is a thermal head for recording said image by heating said thermosensitive coloring layer.

5. (original): A serial printing method according to claim 1, wherein said recording head is a thermal head for heating an ink ribbon from its back side, said image being recorded by transferring one of thermally melted ink and thermally sublimated ink onto a surface of said recording material.

6. (original): A serial printing method according to claim 1, wherein said recording head is an ink-jet recording head for recording said image by jetting ink to said recording material.

7. (previously presented): A serial printer including a carriage and a recording head held thereby, said carriage being reciprocated in a sub-scanning direction which is a width direction of a recording material, and said recording head recording a predetermined number of rows on said recording material in accordance with image data during the forward movement of said carriage, said serial printer comprising:

density measuring means attached to said carriage and for obtaining a measured density of a recorded portion when said carriage is moved backward;

density predicting means for obtaining a predicted density to be recorded on said portion, based on said image data;

operation means for comparing said measured density with said predicted density every portion, said operation means obtaining density difference when said measured density is less than said predicted density;

record correcting means for performing correction recording relative to the defective portion having said density difference, said record correcting means reciprocating said carriage again for the defective portion and driving said recording head in accordance with said density difference during the forward movement of said carriage; and

recording-material advancement means for advancing a sheet of said recording material in a main-scanning direction perpendicular to said sub-scanning direction, in order to record the next predetermined number of the rows on said recording material,

wherein, on the same sheet of the recording material, detection of the density difference and correction recording relative to the defective portion having said density difference are performed.

8. (previously presented): A serial printer including a carriage and a recording head held thereby, said carriage being reciprocated in a sub-scanning direction which is a width direction of a recording material, and said recording head recording a predetermined number of rows on said recording material in accordance with image data during the reciprocation of said carriage, said serial printer comprising:

first density measuring means disposed on one side of said recording head in said sub-scanning direction, said first density measuring means obtaining a measured density of a recorded portion just after recording when said carriage is moved forward;

second density measuring means disposed on the other side of said recording head in said sub-scanning direction, said second density measuring means obtaining a measured density of a recorded portion just after recording when said carriage is moved backward;

density predicting means for obtaining a predicted density to be recorded on said portion, based on said image data;

operation means for comparing said measured density with said predicted density every portion, said operation means obtaining density difference of the defective portion having said measured density which is less than said predicted density;

record correcting means for performing correction recording relative to said defective portion, said record correcting means reciprocating said carriage again for the defective portion and driving said recording head in accordance with said density difference during the movement of said carriage; and

recording-material advancement means for advancing a sheet of said recording material in a main-scanning direction perpendicular to said sub-scanning direction, in order to record the next predetermined number of the rows on said recording material,

wherein, on the same sheet of the recording material, detection of the density difference and correction recording relative to the defective portion having said density difference are performed.

9. (currently amended): A serial printer according to ~~claims 7 or 8~~ claim 7, wherein said density measuring means includes a light emitting element for illuminating said recorded portion, and a light receiving element for converting the reflected light into an electric signal.

10. (original): A serial printer according to claims 7 or 8, wherein said portion is a single pixel.

11. (currently amended): A serial printing method for recording an image on a recording material one line by one line, said line including a plurality of rows of which recording is performed by moving a recording head in a sub-scanning direction which is a width direction of said recording material, and said recording head having a plurality of recording elements arranged in a main-scanning direction perpendicular to said sub-scanning direction, said serial printing method comprising the steps of:

recording said rows with said recording head on a sheet of the recording material;

detecting the broken recording element among said recording elements, said broken recording element being impossible to record due to its failure based on whether a difference between a value output by the broken recording element and a reference value exceeds a predetermined threshold; and

recording said row to be recorded with said broken recording element, by moving said recording head again and by using another normal recording element among said recording elements when the difference exceeds the predetermined threshold, wherein recording said row again occurs on the same sheet of the recording material as the previous recording.

12. (original): A serial printing method according to claim 11, wherein said broken recording element is detected by measuring a density of said row.

13. (original): A serial printing method according to claim 11, wherein said broken recording element is detected by measuring a density of a test pattern recorded by said recording head.

14. (original): A serial printing method according to claim 13, wherein said test pattern is arranged at a lateral side of said row in said sub-scanning direction.

15. (original): A serial printing method according to claim 13, wherein said test pattern is arranged at a downstream side of said row in said main-scanning direction.

16. (currently amended): A serial printer including a carriage reciprocated in a sub-scanning direction which is a width direction of a recording material, a recording head held by said carriage, and moving means for moving said recording material in a main-scanning direction perpendicular to said sub-scanning direction, said recording head having M (M is an integer of two or more) recording elements arranged in said main-scanning direction to record said M rows on said recording material during the movement of said carriage, said serial printer comprising:

density measuring means attached to said carriage and for obtaining a measured density of said row recorded by said recording head;

failure judging means for judging the row as the defective row when a difference between said measured density and a reference value is less than a prescribed value more than a predetermined threshold, said failure judging means judging the corresponding recording element as the broken recording element; and

control means for controlling drive of said recording element, reciprocation of said carriage, and movement of said recording material, when all of said recording elements are

normal, said control means controlling the record under a condition that said recording element is moved every M rows, and when said failure detecting means detects said broken recording element, said control means controlling the record such that said recording material is moved by at least one row in said main-scanning direction to record with the normal recording element relative to said defective row, and successively the record being continued under a condition that said recording material is moved, in said main-scanning direction, in accordance with a number of the normal recording elements,

wherein, on a same sheet of the recording material, the failure judging means judges the defective row and the control means controls the recording element to record.

17. (original): A serial printer according to claim 16, wherein when a number of the consecutive normal recording elements is N (N is an integer more than one and less than M), recording is performed with the consecutive normal recording elements, the number of which is N, in a condition that said recording material is moved in said main-scanning direction every N rows.

18. (original): A serial printer according to claim 17, wherein said density measuring means includes a light emitting element for illuminating said recorded row, and a light receiving element for converting the reflected light into an electric signal.

19. (currently amended): A serial printer including a carriage reciprocated in a sub-scanning direction which is a width direction of a recording material, a recording head held by said carriage, and moving means for moving said recording material in a main-scanning direction

perpendicular to said sub-scanning direction, said recording head having M (M is an integer of two or more) recording elements arranged in said main-scanning direction to record said M rows on said recording material during the movement of said carriage, said serial printer comprising:

density measuring means attached to said carriage and for obtaining a measured density of said row recorded by said recording head;

failure judging means for judging the row as the defective row when a difference between said measured density and a predetermined value is less than a prescribed value is more than a predetermined threshold, said failure judging means judging the corresponding recording element as the broken recording element; and

control means for controlling drive of said recording element, reciprocation of said carriage, and movement of said recording material, when all of said recording elements are normal, said control means controlling the record under a condition that said recording element is moved every (M-J) rows (J is an integer less than M) to overlap the J rows, and when said failure detecting means detects said broken recording element, said control means controlling the record such that said recording material is moved by at least one row in said main-scanning direction to record with the normal recording element relative to said defective row, and successively the record being continued under a condition that said recording material is moved, in said main-scanning direction, in accordance with a number of the normal recording elements,

wherein, on a same sheet of the recording material, the failure judging means judges the defective row and the control means controls the recording element to record.

20. (original): A serial printer according to claim 19, wherein when a number of the consecutive normal recording elements is N (N is an integer more than one and less than M), recording is performed with the consecutive normal recording elements, the number of which is N , in a condition that said recording material is moved in said main-scanning direction every ($N-K$) rows (K is an integer less than N) to overlap the K rows.

21. (original): A serial printer according to claim 20, wherein said density measuring means includes a light emitting element for illuminating said recorded row, and a light receiving element for converting the reflected light into an electric signal.

22. (currently amended): A serial printing method for recording an image on a recording material one line by one line, said line including one or more rows and said line being recorded by moving a recording head of a printer in a width direction of said recording material, said serial printing method comprising the steps of:

discharging a sheet of said recording material on which said image has been recorded, from said printer;

setting said discharged sheet of recording material to said printer again;

detecting whether or not a print defect occurs on said recorded row based whether a difference between recorded data and reference data exceeds a predetermined threshold; and

performing correction recording relative to said row on which said print defect occurs, on said sheet of the recording material based on whether the difference exceeds the threshold.

23. (original): A serial printing method according to claim 22, wherein said print defect of said row is detected by measuring a density of said row.

24. (currently amended): A serial printer including a carriage reciprocated in a sub-scanning direction which is a width direction of a recording material, a recording head held by said carriage, and moving means for moving said recording material in a main-scanning direction perpendicular to said sub-scanning direction, said recording head recording a predetermined number of rows on said recording material in accordance with image data during the reciprocation of said carriage, said serial printer comprising:

image-area detecting means for obtaining positional information of an image area of a sheet of said recording material already recorded;

data making means for making correction image data by calculating positional difference and inclination between said positional information of said image area and positional information of said image data, said data making means inclining and moving said image data in accordance with said positional difference and said inclination;

density predicting means for obtaining a predicted density to be recorded on each portion of said image area, based on said correction image data;

density measuring means attached to said carriage and for obtaining a measured density of said portion of said image area during the movement of said carriage;

operation means for comparing said measured density with said predicted density every portion, said operation means obtaining density difference of the defective portion having said measured density which is less than said predicted density; and

record correcting means for performing correction recording relative to said defective portion, said record correcting means moving said carriage again for the defective portion and

driving said recording head in accordance with said density difference during the movement of said carriage based on whether a difference between recorded data and reference data exceeds a predetermined threshold.

wherein, on a same sheet of said recording material, the operation means obtains the density difference of the defective portion and the record correcting means performs correction recording based on whether the difference exceeds the threshold.

25. (original): A serial printer according to claim 24, wherein said image-area detecting means detects a border line between said image area and its surrounding portion by using said density measuring means to detect said image area, under a condition of moving said carriage and moving said recording material by said moving means.

26. (original): A serial printer according to claim 25, wherein said density measuring means includes a light emitting element for illuminating said recorded portion, and a light receiving element for converting the reflected light into an electric signal.

27. (previously presented): A serial printing method for recording an image on a recording material according to claim 1, wherein both recording the image and correction recording are performed on said recording material where the print defect was detected.

28. (previously presented): A serial printing method for recording an image on a recording material according to claim 3, wherein said print defect is both detected and corrected on said recording material having the lack of pixel density.

29. (previously presented): A serial printer according to claim 7, wherein said operation means obtains the density difference on said recording material, and wherein the record correcting means corrects said density difference on said recording material.

30. (previously presented): A serial printer according to claim 8, wherein the density difference for the defective portion is measured on said recording material, and wherein correction recording for the defective portion is performed on said recording material.

31. (previously presented): A serial printing method for recording an image on a recording material according to claim 11, wherein the row to be recorded with the broken recording element is on said recording material, and wherein the recording head records again with a normal element on said recording material.

32. (previously presented): A serial printer including a carriage reciprocated in a sub-scanning direction according to claim 16, wherein said number of normal recording elements is based on a number of consecutive normal recording elements.

33. (previously presented): A serial printing method for recording an image on a recording material according to claim 20, wherein when the broken element is detected, a determination is made whether said broken element is for recording an end row of a line, and when said broken element records the end row of said line, recording is performed with fifty-percent density.

34. (previously presented): A serial printing method for recording an image on a recording material according to claim 22, wherein the image on said discharged recording

material contains a print defect, and wherein said correction recording corrects the image on said discharged recording material.

35. (previously presented): A serial printing method for recording an image on a recording material according to claim 24, wherein the recording material having the image area is slanted when inserted in the serial printer, and wherein positional difference and inclination between the image area and the image data are based on the slanted insertion.

36. (previously presented): A serial printing method for recording an image on a recording material according to claim 1, wherein recording said row, detecting a print defect on said recorded row, and performing correction recording on said row occur during a same recording operation.

37. (previously presented): A serial printer according to claim 7, wherein obtaining a measured density of a recorded portion, obtaining a predicted density to be recorded on said portion, comparing said measured density with said predicted density every portion, and performing correction recording to the defective portion occur during a same recording operation.

38. (previously presented): A serial printing method according to claim 1, wherein serial printing further comprises recording each row by a single element of the recording head which is scanned in the width direction of said recording material.

39. (new): The printer of claim 7, wherein the correcting means performs correction recording relative to the defective portion when the density difference exceeds a predetermined threshold.